

# Администрирование сетевых подсистем

## Лабораторная работа №3

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## Цели и задачи работы

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Приобретение практических навыков по установке, конфигурированию и интеграции DHCP-сервера Kea с DNS-сервером Bind9, включая настройку динамических обновлений DDNS.

## Ход выполнения

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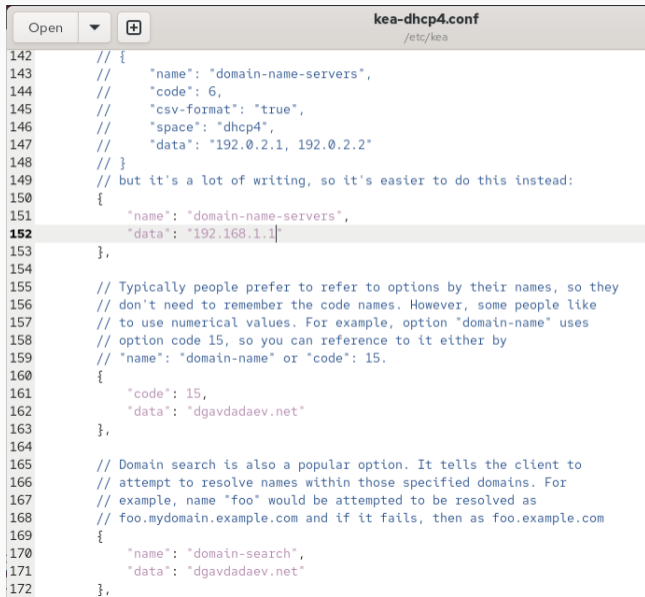
```
Transaction test succeeded.
Running transaction
  Preparing      :                                1/1
  Installing     : mariadb-connector-c-config-3.4.4-1.el10.noarch 1/6
  Installing     : mariadb-connector-c-3.4.4-1.el10.x86_64       2/6
  Installing     : log4cplus-2.1.1-8.el10.x86_64                3/6
  Installing     : libpq-16.8-2.el10_0.x86_64                   4/6
  Installing     : kea-libs-3.0.1-2.el10_1.x86_64                5/6
  Running scriptlet: kea-3.0.1-2.el10_1.x86_64                   6/6
  Installing     : kea-3.0.1-2.el10_1.x86_64                   6/6
  Running scriptlet: kea-3.0.1-2.el10_1.x86_64                   6/6

Installed:
  kea-3.0.1-2.el10_1.x86_64          kea-libs-3.0.1-2.el10_1.x86_64
  libpq-16.8-2.el10_0.x86_64        log4cplus-2.1.1-8.el10.x86_64
  mariadb-connector-c-3.4.4-1.el10.x86_64 mariadb-connector-c-config-3.4.4-1.el10.noarch

Complete!
[root@server.dgavdadaev.net ~]# cp /etc/kea/kea-dhcp4.conf /etc/kea/kea-dhcp4.conf_$(date -I)
[root@server.dgavdadaev.net ~]# █
```

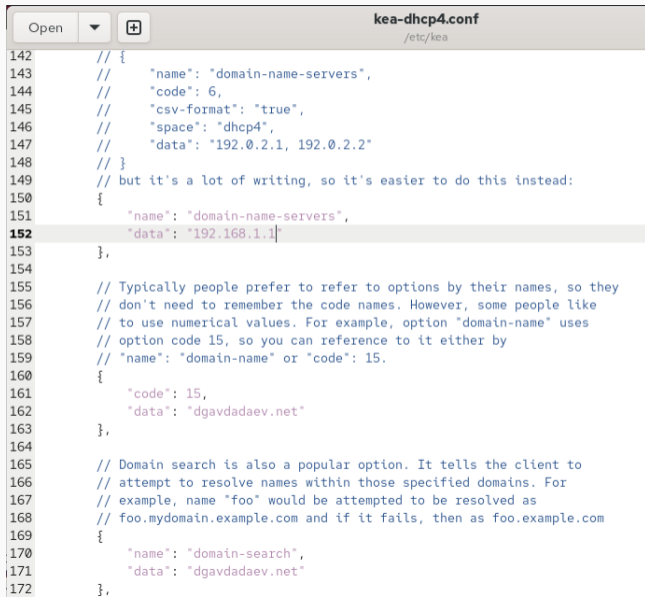
Рис. 1: Установка DHCP

## Резервное копирование конфигурации



```
142 // {
143 //     "name": "domain-name-servers",
144 //     "code": 6,
145 //     "csv-format": "true",
146 //     "space": "dhcp4",
147 //     "data": "192.0.2.1, 192.0.2.2"
148 // }
149 // but it's a lot of writing, so it's easier to do this instead:
150 {
151     "name": "domain-name-servers",
152     "data": "192.168.1.1"
153 },
154
155 // Typically people prefer to refer to options by their names, so they
156 // don't need to remember the code names. However, some people like
157 // to use numerical values. For example, option "domain-name" uses
158 // option code 15, so you can reference to it either by
159 // "name": "domain-name" or "code": 15.
160 {
161     "code": 15,
162     "data": "dgavdadaev.net"
163 },
164
165 // Domain search is also a popular option. It tells the client to
166 // attempt to resolve names within those specified domains. For
167 // example, name "foo" would be attempted to be resolved as
168 // foo.mydomain.example.com and if it fails, then as foo.example.com
169 {
170     "name": "domain-search",
171     "data": "dgavdadaev.net"
172 },
```

## Настройка DNS-параметров



```
142 // {
143 //     "name": "domain-name-servers",
144 //     "code": 6,
145 //     "csv-format": "true",
146 //     "space": "dhcp4",
147 //     "data": "192.0.2.1, 192.0.2.2"
148 // }
149 // but it's a lot of writing, so it's easier to do this instead:
150 {
151     "name": "domain-name-servers",
152     "data": "192.168.1.1"
153 },
154
155 // Typically people prefer to refer to options by their names, so they
156 // don't need to remember the code names. However, some people like
157 // to use numerical values. For example, option "domain-name" uses
158 // option code 15, so you can reference to it either by
159 // "name": "domain-name" or "code": 15.
160 {
161     "code": 15,
162     "data": "dgavdadaev.net"
163 },
164
165 // Domain search is also a popular option. It tells the client to
166 // attempt to resolve names within those specified domains. For
167 // example, name "foo" would be attempted to be resolved as
168 // foo.mydomain.example.com and if it fails, then as foo.example.com
169 {
170     "name": "domain-search",
171     "data": "dgavdadaev.net"
172 },
```

```
284
285 // Below an example of a simple IPv4 subnet declaration. Uncomment to enable
286 // it. This is a list, denoted with [ ], of structures, each denoted with
287 // { }. Each structure describes a single subnet and may have several
288 // parameters. One of those parameters is "pools" that is also a list of
289 // structures.
290 "subnet4": [
291     {
292         "id": 1,
293         "subnet": "192.168.1.0/24",
294         "pools": [ { "pool": "192.168.1.30 - 192.168.1.199" } ],
295         "option-data": [
296             {
297                 "name": "routers",
298                 "data": "192.168.1.1"
299             }
300         ]
301     }
302 ]
303 // You can add more subnets there.
304 }
305 ],
306
307 // There are many, many more parameters that DHCPv4 server is able to use.
308 // They were not added here to not overwhelm people with too much
309 // information at once.
```

Рис. 4: Настройка подсети

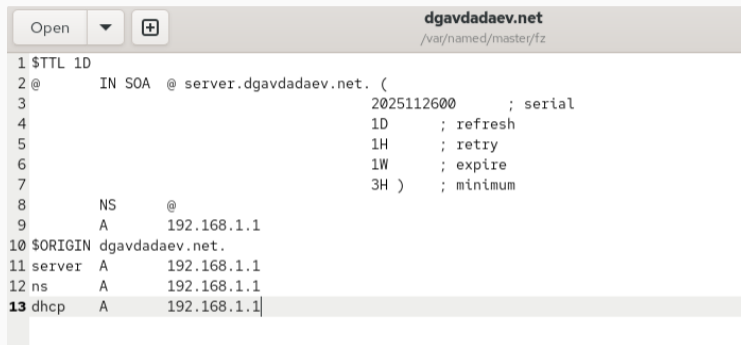
## Проверка и активация DHCP

```
only backend types are available.
[root@server.dgavdadaev.net ~]# kea-dhcp4 -t /etc/kea/kea-dhcp4.conf
2025-11-26 07:34:34.296 WARN [kea-dhcp4.dhcp4/106602.139998790281344] DHCP4_SRV_MT_DISABLED_QUEUE_CONTROL disabling
dhcp queue control when multi-threading is enabled.
2025-11-26 07:34:34.296 WARN [kea-dhcp4.dhcp4/106602.139998790281344] DHCP4_RESERVATIONS_LOOKUP_FIRST_ENABLED Multi
-threading is enabled and host reservations lookup is always performed first.
2025-11-26 07:34:34.296 INFO [kea-dhcp4.dhcp4/106602.139998790281344] DHCP4_SRV_CFGMGR_NEW_SUBNET4 a new subnet has
been added to configuration: 192.168.1.0/24 with params: t1=900, t2=1800, valid-lifetime=3600
2025-11-26 07:34:34.296 INFO [kea-dhcp4.dhcp4/106602.139998790281344] DHCP4_SRV_CFGMGR_SOCKET_TYPE_SELECT using soc
ket type raw
2025-11-26 07:34:34.296 INFO [kea-dhcp4.dhcp4/106602.139998790281344] DHCP4_SRV_CFGMGR_ADD_IFACE listening on inter
face eth1
2025-11-26 07:34:34.296 INFO [kea-dhcp4.dhcp4/106602.139998790281344] DHCP4_SRV_CFGMGR_SOCKET_TYPE_DEFAULT "dhcp-so
cket-type" not specified , using default socket type raw
2025-11-26 07:34:34.296 INFO [kea-dhcp4.dhcp4/106602.139998790281344] DHCP4_SRV_LEASE_MGR_BACKENDS_REGISTERED the f
ollowing lease backend types are available: memfile
2025-11-26 07:34:34.296 INFO [kea-dhcp4.dhcp4/106602.139998790281344] DHCP4_SRV_HOSTS_BACKENDS_REGISTERED the following host
backend types are available:
2025-11-26 07:34:34.296 INFO [kea-dhcp4.dhcp4/106602.139998790281344] DHCP4_SRV_FORENSIC_BACKENDS_REGISTERED the fo
llowing forensic backend types are available:
2025-11-26 07:34:34.296 INFO [kea-dhcp4.dhcp4/106602.139998790281344] DHCP4_SRV_CONFIG_BACKENDS_REGISTERED the following c
onfig backend types are available:
[root@server.dgavdadaev.net ~]#
[root@server.dgavdadaev.net ~]# systemctl --system daemon-reload
[root@server.dgavdadaev.net ~]# systemctl enable kea-dhcp4.service
Created symlink '/etc/systemd/system/multi-user.target.wants/kea-dhcp4.service' → '/usr/lib/systemd/system/kea-dhcp4
.service'.
[root@server.dgavdadaev.net ~]# █
```

Рис. 5: Проверка kea-dhcp4

## Настройка DNS

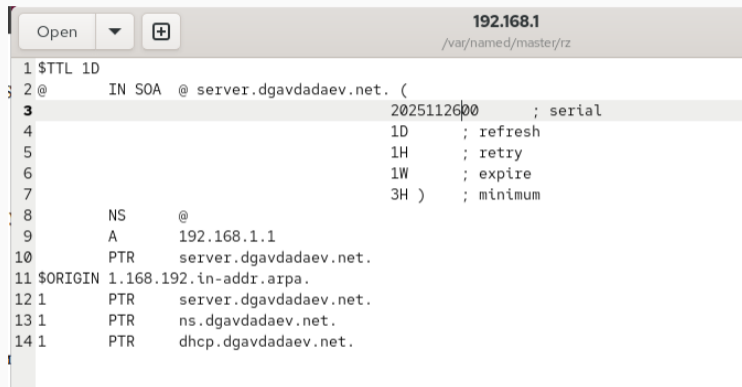
---



The screenshot shows a DNS zone editor window for the domain **dgavdadaev.net**. The window has a title bar with 'Open', a dropdown arrow, and a plus icon. Below the title bar, the path `/var/named/master/fz` is displayed. The main area contains a list of DNS records, each with a line number on the left. The records are as follows:

Line	Record
1	<code>\$TTL 1D</code>
2	<code>@ IN SOA @ server.dgavdadaev.net. (</code>
3	<code>2025112600 ; serial</code>
4	<code>1D ; refresh</code>
5	<code>1H ; retry</code>
6	<code>1W ; expire</code>
7	<code>3H ) ; minimum</code>
8	<code>NS @</code>
9	<code>A 192.168.1.1</code>
10	<code>\$ORIGIN dgavdadaev.net.</code>
11	<code>server A 192.168.1.1</code>
12	<code>ns A 192.168.1.1</code>
13	<code>dhcp A 192.168.1.1</code>

Рис. 6: Прямая зона DNS



```
1 $TTL 1D
2 @      IN SOA  @ server.dgavdadaev.net. (
3                               2025112600      ; serial
4                               1D              ; refresh
5                               1H              ; retry
6                               1W              ; expire
7                               3H )            ; minimum
8      NS      @
9      A        192.168.1.1
10     PTR      server.dgavdadaev.net.
11 $ORIGIN 1.168.192.in-addr.arpa.
12 1        PTR      server.dgavdadaev.net.
13 1        PTR      ns.dgavdadaev.net.
14 1        PTR      dhcp.dgavdadaev.net.
```

Рис. 7: Обратная зона DNS

```
[root@server.dgavdadaev.net ~]#  
[root@server.dgavdadaev.net ~]# systemctl restart named  
[root@server.dgavdadaev.net ~]# ping dhcp.dgavdadaev.net  
PING dhcp.dgavdadaev.net (192.168.1.1) 56(84) bytes of data.  
64 bytes from server.dgavdadaev.net (192.168.1.1): icmp_seq=1 ttl=64 time=0.015 ms  
64 bytes from server.dgavdadaev.net (192.168.1.1): icmp_seq=2 ttl=64 time=0.116 ms  
64 bytes from server.dgavdadaev.net (192.168.1.1): icmp_seq=3 ttl=64 time=0.181 ms  
64 bytes from server.dgavdadaev.net (192.168.1.1): icmp_seq=4 ttl=64 time=0.097 ms  
64 bytes from server.dgavdadaev.net (192.168.1.1): icmp_seq=5 ttl=64 time=0.029 ms  
^C  
--- dhcp.dgavdadaev.net ping statistics ---  
5 packets transmitted, 5 received, 0% packet loss, time 4226ms  
rtt min/avg/max/mdev = 0.015/0.087/0.181/0.060 ms  
[root@server.dgavdadaev.net ~]#
```

Рис. 8: ping dhcp

```
[root@server.dgavdadaev.net ~]# firewall-cmd --add-service=dhcp
success
[root@server.dgavdadaev.net ~]# firewall-cmd --add-service=dhcp --permanent
success
[root@server.dgavdadaev.net ~]# restorecon -vR /etc
[root@server.dgavdadaev.net ~]# restorecon -vR /var/named/
[root@server.dgavdadaev.net ~]# restorecon -vR /var/lib/kea/
[root@server.dgavdadaev.net ~]# systemctl start kea-dhcp4.service
[root@server.dgavdadaev.net ~]#
```

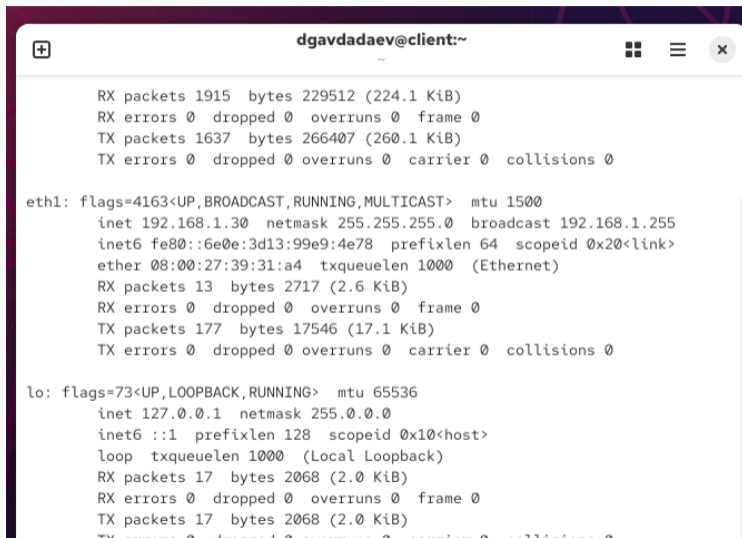
Рис. 9: firewall + SELinux

## Настройка DHCP-клиента

---

```
1  #!/bin/bash
2  echo "Provisioning script $0"
3  nmcli connection modify "eth1" ipv4.gateway "192.168.1.1"
4  nmcli connection up "eth1"
5  nmcli connection modify eth0 ipv4.never-default true
6  nmcli connection modify eth0 ipv6.never-default true
7  nmcli connection down eth0
8  nmcli connection up eth0
9  # systemctl restart NetworkManager
10
```

Рис. 10: routing script



```
dgavdadaev@client:~  
RX packets 1915  bytes 229512 (224.1 KiB)  
RX errors 0  dropped 0  overruns 0  frame 0  
TX packets 1637  bytes 266407 (260.1 KiB)  
TX errors 0  dropped 0  overruns 0  carrier 0  collisions 0  
  
eth1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500  
    inet 192.168.1.30  netmask 255.255.255.0  broadcast 192.168.1.255  
    inet6 fe80::6e0e:3d13:99e9:4e78  prefixlen 64  scopeid 0x20<link>  
    ether 08:00:27:39:31:a4  txqueuelen 1000  (Ethernet)  
    RX packets 13  bytes 2717 (2.6 KiB)  
    RX errors 0  dropped 0  overruns 0  frame 0  
    TX packets 177  bytes 17546 (17.1 KiB)  
    TX errors 0  dropped 0  overruns 0  carrier 0  collisions 0  
  
lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536  
    inet 127.0.0.1  netmask 255.0.0.0  
    inet6 ::1  prefixlen 128  scopeid 0x10<host>  
    loop txqueuelen 1000  (Local Loopback)  
    RX packets 17  bytes 2068 (2.0 KiB)  
    RX errors 0  dropped 0  overruns 0  frame 0  
    TX packets 17  bytes 2068 (2.0 KiB)  
    TX errors 0  dropped 0  overruns 0  carrier 0  collisions 0
```

Рис. 11: ifconfig eth1

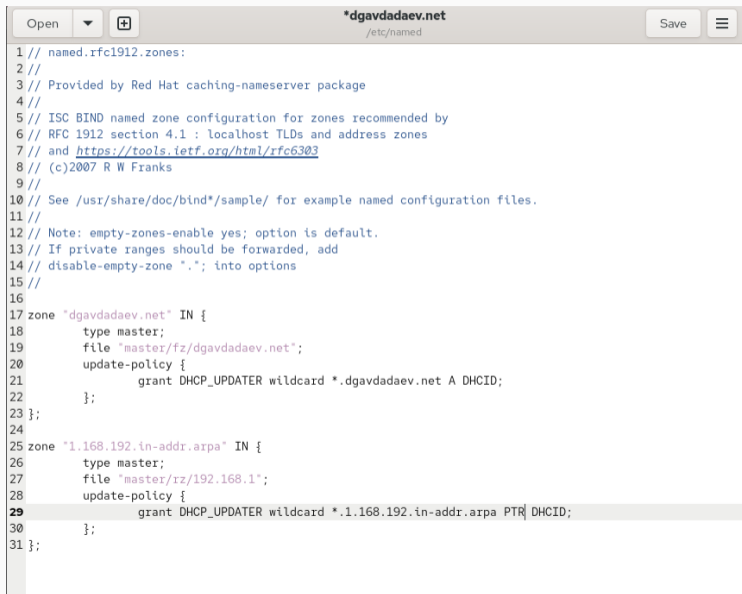
## Настройка DDNS

---

```
[root@server.dgavdadaev.net ~]#  
[root@server.dgavdadaev.net ~]# mkdir -p /etc/named/keys  
[root@server.dgavdadaev.net ~]# tsig-keygen -a HMAC-SHA512 DHCP_UPDATER > /etc/named/keys/dhcp_updater.key  
[root@server.dgavdadaev.net ~]# cat /etc/named/keys/dhcp_updater.key  
key "DHCP_UPDATER" {  
    algorithm hmac-sha512;  
    secret "04w6oANM7B41CKBp8kq6nmvI7wN0im9HvvV16InodYMS8Glmc17kG0J6Rl02ivGMcBFuMdubSPwZVXXWgGTtzA==";  
};  
[root@server.dgavdadaev.net ~]# chown -R named:named /etc/named/keys/  
[root@server.dgavdadaev.net ~]#
```

Рис. 12: TSIG key

# Настройка update-policy в Bind9



```
1 // named.rfc1912.zones:
2 //
3 // Provided by Red Hat caching-nameserver package
4 //
5 // ISC BIND named zone configuration for zones recommended by
6 // RFC 1912 section 4.1 : localhost TLDs and address zones
7 // and https://tools.ietf.org/html/rfc6303
8 // (c)2007 R W Franks
9 //
10 // See /usr/share/doc/bind*/sample/ for example named configuration files.
11 //
12 // Note: empty-zones-enable yes; option is default.
13 // If private ranges should be forwarded, add
14 // disable-empty-zone "."; into options
15 //
16
17 zone "dgavdadaev.net" IN {
18     type master;
19     file "master/fz/dgavdadaev.net";
20     update-policy {
21         grant DHCP_UPDATER wildcard *.dgavdadaev.net A DHCID;
22     };
23 };
24
25 zone "1.168.192.in-addr.arpa" IN {
26     type master;
27     file "master/rz/192.168.1";
28     update-policy {
29         grant DHCP_UPDATER wildcard *.1.168.192.in-addr.arpa PTR DHCID;
30     };
31 };
```

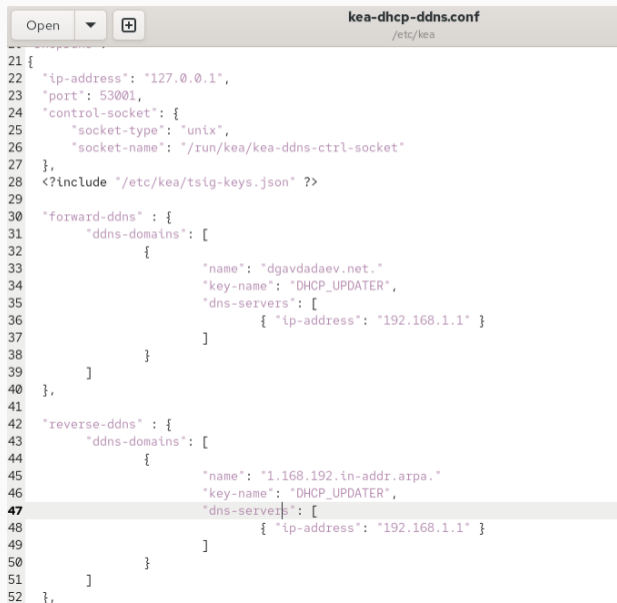


The image shows a text editor window with the title bar "tsig-keys.json" and the path "/etc/kea". The editor contains the following JSON content:

```
1 "tsig-keys" [
2 {
3     "name": "DHCP_UPDATER",
4     "algorithm": "hmac-sha512",
5     "secret": "04w6oANM7B4lCKBp8kq6nmvI7wN0im9HvvV16InodYMS8G1mc17kG0J6RlO2ivGMcBFuMdubSPwZVXXWgGTtzA=="
6 }
7 ]
```

Рис. 14: tsig JSON

## Настройка kea-dhcp-ddns

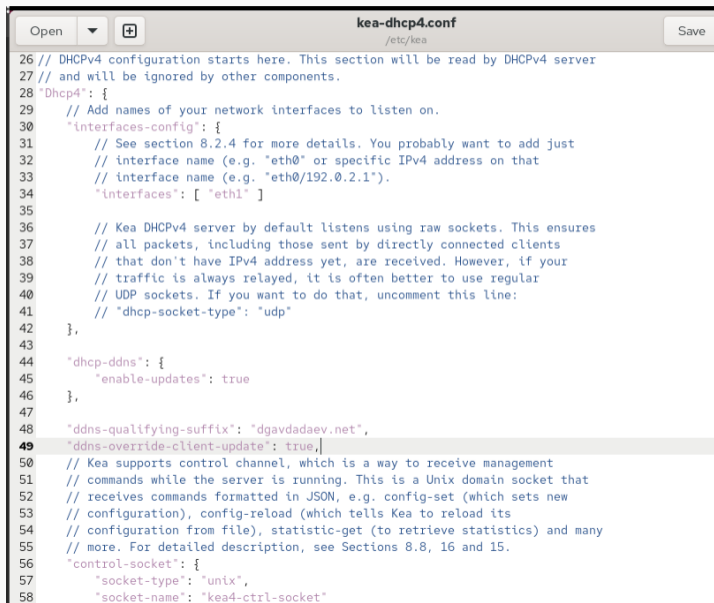


```
21 {
22   "ip-address": "127.0.0.1",
23   "port": 53001,
24   "control-socket": {
25     "socket-type": "unix",
26     "socket-name": "/run/kea/kea-ddns-ctrl-socket"
27   },
28   <?include "/etc/kea/tsig-keys.json" ?>
29
30   "forward-ddns" : {
31     "ddns-domains": [
32       {
33         "name": "dgavdadaev.net.",
34         "key-name": "DHCP_UPDATER",
35         "dns-servers": [
36           { "ip-address": "192.168.1.1" }
37         ]
38       }
39     ]
40   },
41
42   "reverse-ddns" : {
43     "ddns-domains": [
44       {
45         "name": "1.168.192.in-addr.arpa.",
46         "key-name": "DHCP_UPDATER",
47         "dns-servers": [
48           { "ip-address": "192.168.1.1" }
49         ]
50       }
51     ]
52   },
```

```
[root@server.dgavdadaev.net ~]#  
[root@server.dgavdadaev.net ~]# kea-dhcp-ddns -t /etc/kea/kea-dhcp-ddns.conf  
2025-11-26 07:58:47.077 INFO [kea-dhcp-ddns.dctl/110367.140315119093632] DCTL_CONFIG_CHECK_COMPLETE server has completed configuration check: listening on 127.0.0.1, port 53001, using UDP, result: success(0), text=Configuration check successful  
[root@server.dgavdadaev.net ~]# systemctl enable --now kea-dhcp-ddns.service  
Created symlink '/etc/systemd/system/multi-user.target.wants/kea-dhcp-ddns.service' → '/usr/lib/systemd/system/kea-dhcp-ddns.service'.  
[root@server.dgavdadaev.net ~]# systemctl status kea-dhcp-ddns.service  
● kea-dhcp-ddns.service - Kea DHCP-DDNS Server  
   Loaded: loaded (/usr/lib/systemd/system/kea-dhcp-ddns.service; enabled; preset: disabled)  
   Active: active (running) since Wed 2025-11-26 07:59:18 UTC; 7s ago  
 Invocation: 28254cf5ca74f9da46e1e81c99e1041  
    Docs: man:kea-dhcp-ddns(8)  
 Main PID: 110616 (kea-dhcp-ddns)  
   Tasks: 5 (limit: 10381)  
  Memory: 2.2M (peak: 7M)  
    CPU: 12ms  
   CGroup: /system.slice/kea-dhcp-ddns.service  
           └─110616 /usr/sbin/kea-dhcp-ddns -c /etc/kea/kea-dhcp-ddns.conf  
  
Nov 26 07:59:18 server.dgavdadaev.net systemd[1]: Started kea-dhcp-ddns.service - Kea DHCP-DDNS Server.  
Nov 26 07:59:18 server.dgavdadaev.net kea-dhcp-ddns[110616]: 2025-11-26 07:59:18.474 INFO [kea-dhcp-ddns.dctl/110616] DCTL_CONFIG_CHECK_COMPLETE server has completed configuration check: listening on 127.0.0.1, port 53001, using UDP, result: success(0), text=Configuration check successful  
Nov 26 07:59:18 server.dgavdadaev.net kea-dhcp-ddns[110616]: INFO COMMAND_ACCEPTOR_START Starting to accept connections  
Nov 26 07:59:18 server.dgavdadaev.net kea-dhcp-ddns[110616]: INFO DCTL_CONFIG_CHECK_COMPLETE server has completed configuration check: listening on 127.0.0.1, port 53001, using UDP, result: success(0), text=Configuration check successful  
Nov 26 07:59:18 server.dgavdadaev.net kea-dhcp-ddns[110616]: INFO DHCP_DDNS_STARTED Kea DHCP-DDNS server version 3.10.0  
lines 1-17/17 (END)
```

Рис. 16: kea-dhcp-ddns.service

## Разрешение DDNS в Kea DHCP



```
26 // DHCPv4 configuration starts here. This section will be read by DHCPv4 server
27 // and will be ignored by other components.
28 "Dhcp4": {
29     // Add names of your network interfaces to listen on.
30     "interfaces-config": {
31         // See section 8.2.4 for more details. You probably want to add just
32         // interface name (e.g. "eth0" or specific IPv4 address on that
33         // interface name (e.g. "eth0/192.0.2.1").
34         "interfaces": [ "eth1" ]
35
36         // Kea DHCPv4 server by default listens using raw sockets. This ensures
37         // all packets, including those sent by directly connected clients
38         // that don't have IPv4 address yet, are received. However, if your
39         // traffic is always relayed, it is often better to use regular
40         // UDP sockets. If you want to do that, uncomment this line:
41         // "dhcp-socket-type": "udp"
42     },
43
44     "dhcp-ddns": {
45         "enable-updates": true
46     },
47
48     "ddns-qualifying-suffix": "dgavdadaev.net",
49     "ddns-override-client-update": true,
50     // Kea supports control channel, which is a way to receive management
51     // commands while the server is running. This is a Unix domain socket that
52     // receives commands formatted in JSON, e.g. config-set (which sets new
53     // configuration), config-reload (which tells Kea to reload its
54     // configuration from file), statistic-get (to retrieve statistics) and many
55     // more. For detailed description, see Sections 8.8, 16 and 15.
56     "control-socket": {
57         "socket-type": "unix",
58         "socket-name": "kea4-ctrl-socket"
```

# Перезапуск DHCP

```
[root@server.dgavdadaev.net ~]#  
[root@server.dgavdadaev.net ~]# systemctl restart kea-dhcp4.service  
[root@server.dgavdadaev.net ~]# systemctl status kea-dhcp4.service  
● kea-dhcp4.service - Kea DHCPv4 Server  
   Loaded: loaded (/usr/lib/systemd/system/kea-dhcp4.service; enabled; preset: disabled)  
   Active: active (running) since Wed 2025-11-26 08:02:40 UTC; 11s ago  
 Invocation: 946c493824fc43bfa12e283ab5e2d642  
    Docs: man:kea-dhcp4(8)  
 Main PID: 111176 (kea-dhcp4)  
   Status: "Dispatching packets..."  
   Tasks: 7 (limit: 10381)  
  Memory: 2.5M (peak: 6.9M)  
     CPU: 14ms  
   CGroup: /system.slice/kea-dhcp4.service  
           └─111176 /usr/sbin/kea-dhcp4 -c /etc/kea/kea-dhcp4.conf  
  
Nov 26 08:02:40 server.dgavdadaev.net systemd[1]: Starting kea-dhcp4.service - Kea DHCPv4 Server...  
Nov 26 08:02:40 server.dgavdadaev.net kea-dhcp4[111176]: 2025-11-26 08:02:40.884 INFO [kea-dhcp4.dhcp4/111176.1406]  
Nov 26 08:02:40 server.dgavdadaev.net kea-dhcp4[111176]: 2025-11-26 08:02:40.885 INFO [kea-dhcp4.commands/111176.1]  
Nov 26 08:02:40 server.dgavdadaev.net systemd[1]: Started kea-dhcp4.service - Kea DHCPv4 Server.  
lines 1-17/17 (END)
```

Рис. 18: restart kea-dhcp4

## Проверка DDNS

---

## Проверка записи клиента через dig

```
[dgavdadaev@client.dgavdadaev.net ~]$ dig @192.168.1.1 client.dgavdadaev.net

; <<>> DiG 9.18.33 <<>> @192.168.1.1 client.dgavdadaev.net
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 18362
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 1232
; COOKIE: acd231d3713d7f98010000006926b48e2c8633fe55fc21f6 (good)
;; QUESTION SECTION:
;client.dgavdadaev.net.          IN      A

;; ANSWER SECTION:
client.dgavdadaev.net. 1200    IN      A      192.168.1.30

;; Query time: 0 msec
;; SERVER: 192.168.1.1#53(192.168.1.1) (UDP)
;; WHEN: Wed Nov 26 08:04:31 UTC 2025
;; MSG SIZE rcvd: 94

[dgavdadaev@client.dgavdadaev.net ~]$
```

Рис. 19: dig client

## Подготовка provisioning

---

```
[root@server.dgavdadaev.net ~]#  
[root@server.dgavdadaev.net ~]# cd /vagrant/provision/server/  
[root@server.dgavdadaev.net server]# mkdir -p /vagrant/provision/server/dhcp/etc/kea  
[root@server.dgavdadaev.net server]# cp -R /etc/kea/* /vagrant/provision/server/dhcp/etc/kea  
[root@server.dgavdadaev.net server]#  
[root@server.dgavdadaev.net server]# cp -R /var/named/* /vagrant/provision/server/dns/var/named/  
cp: overwrite '/vagrant/provision/server/dns/var/named/master/rz/192.168.1'? y  
cp: overwrite '/vagrant/provision/server/dns/var/named/master/fz/dgavdadaev.net'? y  
[root@server.dgavdadaev.net server]# y  
bash: y: command not found...  
[root@server.dgavdadaev.net server]# cp -R /etc/named/* /vagrant/provision/server/dns/etc/named/  
cp: overwrite '/vagrant/provision/server/dns/etc/named/dgavdadaev.net'? y  
[root@server.dgavdadaev.net server]# touch dhcp.sh  
[root@server.dgavdadaev.net server]# █
```

Рис. 20: provisioning copy

```
1  #!/bin/bash
2  echo "Provisioning script $0"
3  echo "Install needed packages"
4  dnf -y install kea
5  echo "Copy configuration files"
6  cp -R /vagrant/provision/server/dhcp/etc/kea/* /etc/kea/
7  echo "Fix permissions"
8  chown -R kea:kea /etc/kea
9  chmod 640 /etc/kea/tsig-keys.json
10 restorecon -vR /etc
11 restorecon -vR /var/lib/kea
12 echo "Configure firewall"
13 firewall-cmd --add-service dhcp
14 firewall-cmd --add-service dhcp --permanent
15 echo "Start dhcpd service"
16 systemctl --system daemon-reloadsystemctl enable --now kea-dhcp4.service
17 systemctl enable --now kea-dhcp-ddns.service
```

Рис. 21: dhcp.sh

## Выводы

---

В ходе работы был установлен и настроен DHCP-сервер Kea, интегрированный с Bind9 для динамических DNS-обновлений.

Созданы TSIG-ключи, настроены правила обновления прямой и обратной зоны, включено автоматическое формирование A и PTR-записей.

Проверено получение адреса клиентом и корректное появление DNS-записей.

Структура provisioning подготовлена для автоматизации развёртывания стенда.